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A complete specimen of *Peachella brevispina* Palmer—an unusual olenellid trilobite (Arthropoda: Olenellida) from the lower Cambrian of California

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Abstract. The thorax and possible pygidium of *Peachella brevispina* are described for the first time from a recently collected complete specimen, the first recovered for this genus. Unusual features include the large macropleural third segment of the prothorax that distorts the adjacent pleurae, the rounded distal extremeties of the other prothoracic segments, the rather gradual transition from the prothorax to the opisthothorax, and the large, triangular pygidium.

Introduction

Olenellid trilobites are found in Lower Cambrian strata in various parts of the world, and numerous specimens have been collected from localities in western North America. Olenellids are broad, flat, medium to large-sized trilobites characterized by a large semicircular cephalon, prominent ocular lobes, numerous thoracic segments that terminate laterally in spines of various lengths, and a small pygidium. The absence of specialized morphologic features on the thorax that were used for enrollment in other trilobites (Bergström 1973:17) indicates that trilobites of the Family Olenellidae were unable to enroll (Harrington 1959:102), a protective feature that developed in other Lower Cambrian (Rasetti 1948:17–18, pl. 4, figs. 22–24) and later trilobites.

Initial taxonomic efforts on olenellid trilobites resulted in the recognition of a number of closely related genera (Walcott 1910) and species (Resser and Howell 1938). More recent work (Fritz 1972, Palmer and Halley 1979) has resulted in recognition of fewer genera, because the criteria originally used to discriminate certain genera intergrade among various species. Added to this problem is the fact that olenellids frequently occur in the same beds of rock in pairs of closely related taxa that have been variously interpreted as paired species or dimorphs (see Palmer and Halley 1974:66–67 for a recent discussion of these taxonomic problems).

The complete specimen of *Peachella brevispina* Palmer described in this paper was collected by R. L. Clark from the lower part of the Carrara Formation at Emigrant Pass in the Nopah Range, Inyo County, California (Fig. 1). Palmer and Halley (1979: 13, 75; fig. 1) reported that *P. brevispina* is moderately rare in the Thimble Limestone Member of the Carrara in the nearby Dublin Hills and at Eagle Mountain. Mount (1980:78–80; fig. 1) described the Emigrant Pass locality in the Nopah Range, including a detailed columnar section and range chart in which he reported *P. brevispina* from a thin limestone bed near the top of an unnamed lower member of the Carrara. Mount's columnar section supports Palmer and Halley's observation (p. 9, 13; figs. 6A, 11) that the Thimble Limestone Member of the Carrara cannot be recognized in the Nopah Range because the Thimble grades southeastward into shale.

Peachella is an unusual genus of olenellid trilobites that was known only from a small number of cephala before Clark's discovery of the complete specimen described in this paper. The glabella, ocular lobes and cephalic border are fainter and less well defined than usual for an olenellid. The most unusual feature of the cephalon is the genal spines, which are normally long and pointed in other olenellids but in species of *Peachella* are short, wide and have broadly rounded tips. First described by Walcott in 1910, this scarce genus included only the type species *Peachella iddingsi* (Walcott) until 1979, when Palmer described a second species, *P. brevispina,* from the Thimble Limestone. Clark's discovery of a complete specimen, which he donated to the San Diego Natural History Museum (SDSNH locality no. 3169), allows the description of this unusual trilobite to be completed.

Morphologic terms used in the following description are defined in Harrington (1959). Suprageneric classification follows Bergström (1973) and Palmer and Halley (1979).

Systematic Paleontology

Phylum Arthropoda Siebold and Stannius, 1845
Class Trilobita Walch, 1771
Order Olenellida Resser, 1938
Family Olenellidae Vogdes, 1893
Genus *Peachella* Walcott, 1910
Peachella brevispina Palmer, 1979
Figures 2, 3

Peachella brevispina PALMER *in* Palmer and Halley (1979:75, pl. 5, figs 1–3).

Material.—1 complete decalcified specimen (SDSNH 24548) preserved as internal and external molds; specimen slightly deformed, especially the cephalon and pygidium.

Description.—Length of specimen 33 mm (excluding macropleural spines). Cephalon semicircular in outline with short, paddle-like genal spines. Anterior end of cephalon poorly preserved. Glabella prominent, elongate, extends close to anterior edge of cephalon, set off by rather shallow axial furrows. No lateral glabellar or occipital furrows visible. Occipital ring not differentiated. Ocular lobes poorly preserved, apparently short, arcuate and located close to the glabella. Anterior border and border furrow not preserved. Lateral border narrow opposite anterior end of glabella, gradually widens posteriorly. Lateral border furrow shallow, curved slightly adaxially at anterior end of genal spine, crossing adaxial base of genal spine and continuing to posterior margin of cephalon. Posterior border furrow not visible. Characteristic genal spines short, broad, moderately inflated, posterolaterally directed; spine termination broadly rounded.

Prothorax of 15 segments. Axis prominent, convex, width (trans.) approximately one-fourth of prothoracic width. Most articulating half-rings visible on outstretched specimen. Axial furrows shallow. Axial ring and transverse furrow of first prothoracic segment slope steeply anteriorly, articulating half-ring apparently still connected to posterior ventral edge of cephalon. Axial ring of second prothoracic segment separated from narrow articulating half-ring by prominent, wide, deep transverse furrow that curves slightly anteriorly abaxially and intersects the axial furrows. Remaining axial rings separated from articulating half-rings by faint, narrow transverse furrow that curves anteriorly abaxially and terminates near anterior edge of ring before reaching axial furrows. This furrow deepest on axial rings of prothoracic segments 12–14, becoming progressively fainter on anterior segments. Small axial node present on posterior edge of axial rings of prothoracic segments 10–14; node most prominent on segment 14, progressively diminishing in size anteriorly. Prothoracic segment 15 broken at axis, undoubtedly bears axial spine whose mold can be seen entering the surrounding rock just posterior of the opisthothorax.

Pleurae of prothorax variable in appearance. Pleurae of first two prothoracic seg-

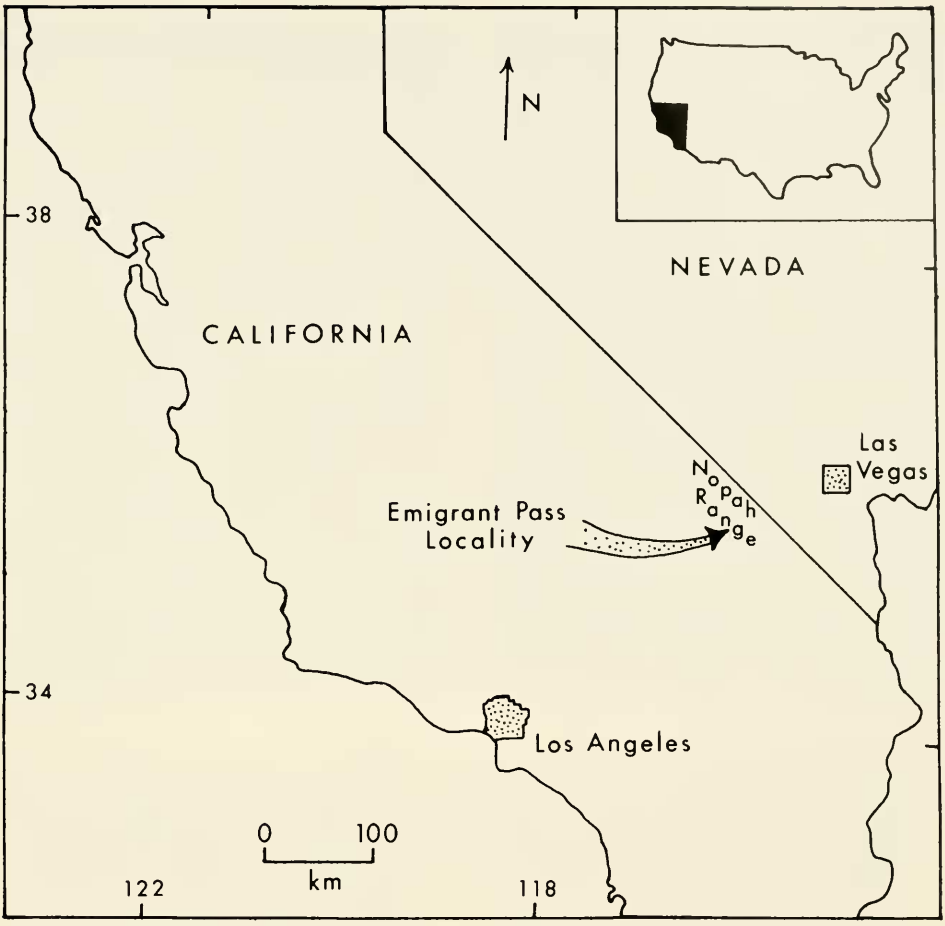

FIGURE 1. Map showing location of Emigrant Pass locality where described specimen was collected.

ments not well preserved, appearing flat with no pleural furrows and rounded distal extremities. Faint transverse ridge(s) present on left pleurae of segments 1 and 2 not present on right pleurae, and interpreted to be result of deformation of specimen. Pleurae of segment 3 expand rapidly abaxially, especially along posterior edge, becoming broadly oval in shape and approximately seven times as long (exsag.) as the pleurae of any other segment. Pleurae of segment 3 reach maximum length (exsag.) near distal margins of thorax, pleurae narrow abaxial of maximum length to form large, long macropleural spine that curves posteriorly and extends well beyond the posterior end of the specimen. Unusual ovoid shape of pleurae of segment 3 distorts shape of pleurae of segments 2 and 4–6, forcing these pleurae to compress abaxially and to taper distally (to rounded extremeties) in order to accommodate wider pleurae of segment 3 without leaving gaps or overlaps between pleurae. Pleurae of prothoracic segments 7–14 rather plain, nearly flat, with rounded distal extremeties. All pleurae posterior of third pleurae divided into narrow anterior and posterior bands by broad, shallow pleural furrow. Pleural furrow narrower and deeper in segments 12–14. Pleurae of prothoracic segments 10–14 bend gently to the posterior abaxially, with posterior bending greatest toward posterior end of prothorax.

Opisthothorax consists of eight or nine segments. Axis only faintly defined by very shallow axial furrows. Pleurae simple, nearly flat, apparently with no pleural furrows and rounded distal extremeties.

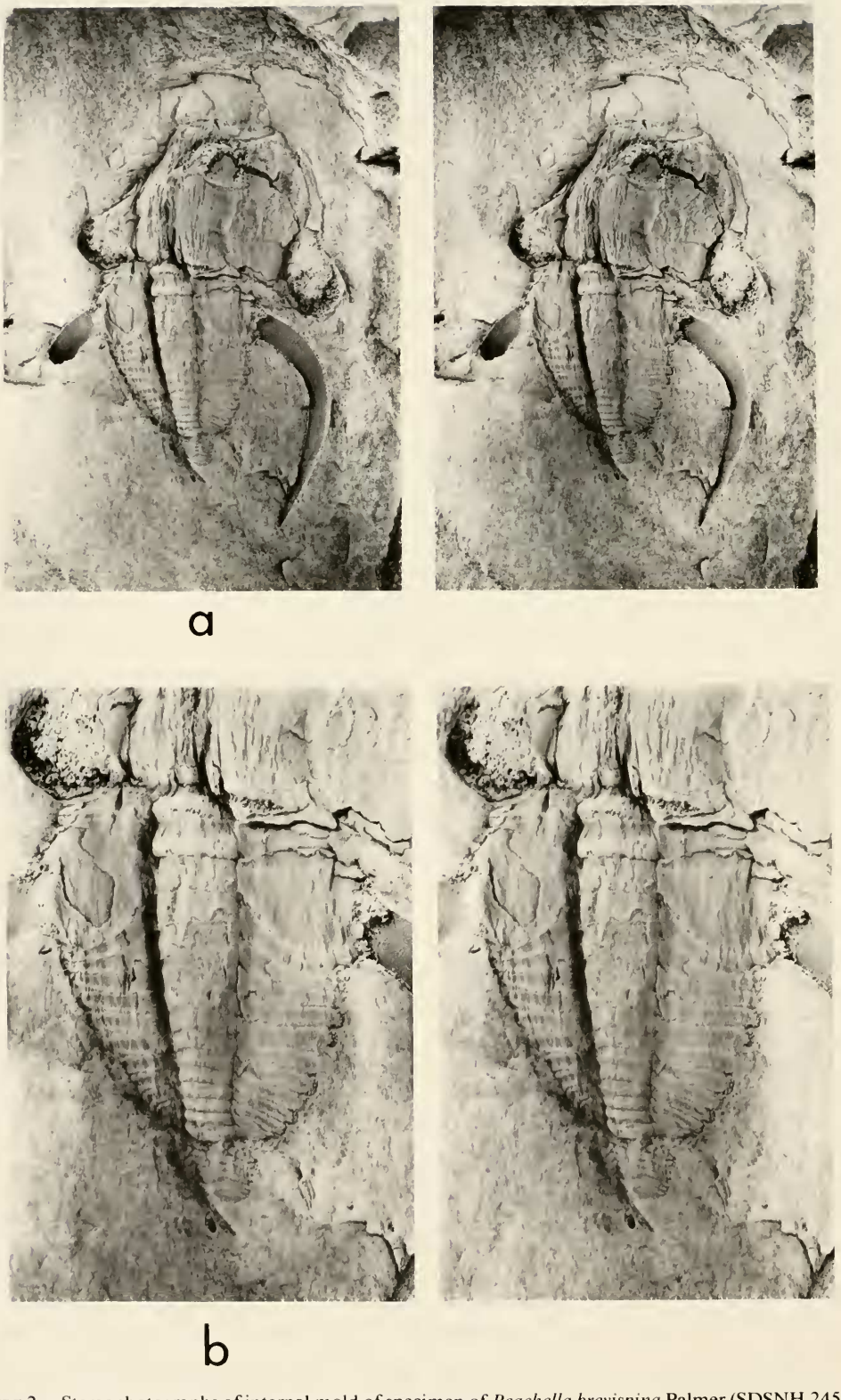

FIGURE 2. Stereophotographs of internal mold of specimen of *Peachella brevispina* Palmer (SDSNH 24548) from lower part of Carrara Formation, Emigrant Pass, California; a. entire specimen, ×2; b. enlargement of thorax and pygidium, ×4.

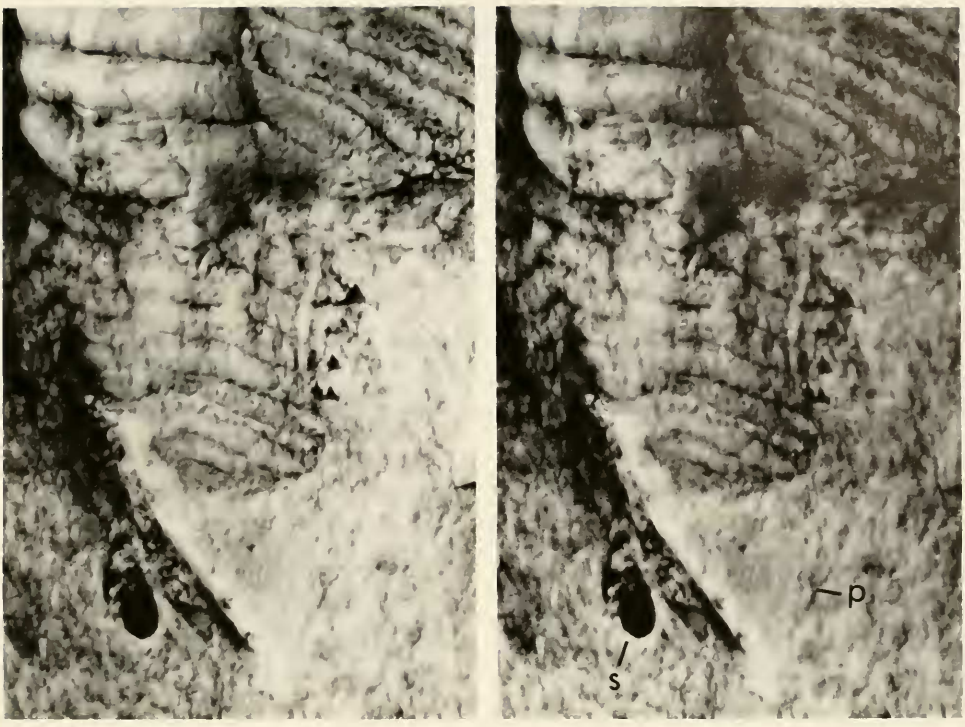

FIGURE 3. Stereophotographs (×16) of segments 13–15 of the prothorax, the opisthothorax, and the possible pygidium (p) of *Peachella brevispina* Palmer. The pygidium is poorly preserved and twisted underneath and to the right so that only the axis and right pleural region are visible. Note also that the axial ring of prothoracic segment 15 is broken. The base of the spine that extended upward and backward from this segment is preserved on the counterpart to this specimen, and the mold of this spine (s) enters the rock to the left of the possible pygidium.

Pygidium possibly present, although twisted to right and only partly preserved on internal and external molds. Overall shape broadly triangular, with convex axis tapering posteriorly and extending almost to pygidial margin. Pleural area smooth, slightly convex, with no border or border furrow.

Remarks.—The cephalon of *Peachella brevispina* is characterized by its faintly defined glabella and border furrow, short ocular lobes, and short, moderately inflated paddle-like genal spines. The cephala illustrated by Palmer and Halley (1979, pl. 5, figs. 1, 2) are much better preserved than the cephalon on this complete specimen.

The most unusual features of the prothorax are the pleurae of the third segment, which expand rapidly away from the axial furrows and become broadly oval in shape, crowding and distorting the adjacent pleurae. Other unusual features include the rounded distal extremeties of the prothoracic pleurae; on most olenellid trilobites, the pleurae terminate laterally in spines. The prothoracic segments diminish in size posteriorly and somewhat grade into the segments of the opisthothorax, although the junction between these two parts of the thorax is not perfectly preserved. Palmer (in Palmer and Halley 1979:73) described a partly preserved thorax of *Olenellus multinodus* (pl. 4, figs. 7, 8) that has enlarged pleurae on the third prothoracic segment and a gradual transition from the pleurae of the prothorax to the pleurae of the opisthothorax. He suggests that these features might merit placing *O. multinodus* in a new genus (possibly with *Olenellus arcuatus*) if additional specimens prove that these features are characteristic of the species. These two species also have short ocular lobes. Similar features are present on *P. brevispina,* which has in addition the unusual and generically distinctive paddle-shaped genal spines not present on *O. multinodus* or *O. arcuatus.* This mix of similar

unusual features on species that clearly belong in different genera illustrates once again some of the problems in generic level taxonomy in olenellids.

If indeed the pygidium of *P. brevispina* is preserved in a twisted position at the posterior end of the opisthothorax, then *P. brevispina* also has an unusual pygidium for an olenellid to add to its other peculiarities. Olenellid pygidia (when preserved) are very small, short trapezoidal plates attached to the end of the narrow opisthothorax. The apparent pygidium of *P. brevispina* is relatively large, triangular in shape, and has broad, smooth pleural areas, a combination which makes the pygidium of this species unique among olenellids.

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